

OgierElectronics

Licensed v Public Band

There are three advantages in using the public bands at 2.4 and 5.8 GHz. The first is that there is no licence fee to pay, and in most countries the regulations and controls associated with equipment in those bands are relatively lax. This means that it is easy to set up a system and to operate it to its maximum capability without any undue regulatory involvement.

The second benefit is that because the frequencies are low, there is relatively little fade due to rain and other weather effects. In addition the lower frequencies allow the signals to penetrate walls and foliage or to be reflected from the local terrain, walls and other structures, which in turn means that it allows non line of sight transmissions to be achieved without too much difficulty.

The third advantage is that the equipment is cheap. Most equipments are based on Wi-Fi or other similar technologies, the chips for which are included in laptops and other devices and are therefore available from several suppliers at very low prices.

The major disadvantage is an inevitable consequence of the advantages. Because there is no licence, the bands can be used, and are used, by everyone. All the wireless laptops in the world use these frequencies. This is in addition to other wireless systems, every microwave oven and any of number of ISM systems. Interference is therefore inevitable.

This is not a serious problem in domestic applications where the ranges are very short at a few tens of metres. It is also not a major limitation in local area broadband wireless systems that provide access to the internet because these systems are packet switched, such that if there is interference on one packet it is simply re-transmitted. The overall effect is that the transmission rates are slowed.

In CCTV on the other hand, the effects are much more noticeable because the video is required to be transmitted continuously in as close to real time as possible. Any interference will cause the picture to freeze or perhaps become corrupted, which will then cause problems for operators if they need to use the system to follow an incident or perhaps to track a target.

Technologies have been developed that claim to reduce interference. Spread spectrum is one where the power is spread over the full band. In theory and at low data rates, it is very effective, but in practice at the moderate or high data rates used in CCTV, the benefits are negligible. Similarly, the use of adaptive antenna arrays to null out the interference has been proposed. These systems provide some advantage but only at the Control Centre, not at the camera, and the benefits rapidly dwindle in the real world where there could be many sources of interference.

Interference becomes more serious as the ranges increase. The use of multiple channels alleviates the problem to some extent but nevertheless it is inevitable that interference will occur if the technology is used in a citywide CCTV system. At present the rule of thumb is that the system can be employed in a retail park a few hundred metres square because there is a reasonable level of confidence that there will be no interference. In the future however, with the increasing use of Wi-Fi and Wi-Max, there can be no certainty that this will continue.

On the other hand in a town centre system, it is almost certain that there will be interference sooner or later. In some cases, this can be avoided by switching channels or by re-locating units. In other cases, nothing can be done and the system will inevitably be degraded.

Licensed bands by comparison require regulatory approval, which can sometimes be difficult to obtain. In the UK, some other European countries and in many parts of the Middle East there are no serious problems in obtaining licences. Elsewhere however, the bureaucratic problems can be immense and it is virtually impossible to obtain a licence, in which case there is no option but to use a licence exempt band.

The major benefit of using a licenced band is that interference free operation can be unconditionally guaranteed. The other benefit for military systems, is that the use of the high technology at 31 and 58 GHz together with the narrow antenna beamwidths makes unauthorised reception or deliberate jamming virtually impossible.

In addition, since considerable spectrum is available in the higher licenced bands, 600 MHz at 31 GHz and 1,000 MHz at 58 GHz, no compromises have to be made on the video quality by reducing the data rates and the bandwidths. The same is not true in the licence exempt bands where the bandwidths are very limited and compromises have to be made if there are more than a few cameras in the system.

The two disadvantages in using the licence bands are the cost of the equipment, which is higher than the unlicenced because it is specialised professional equipment rather than being based on consumer products. Also, in general the only licenced frequencies are high and therefore it is impossible to use them for non line of sight systems because the signals do not penetrate walls and foliage or reflect efficiently from buildings.

The conclusion from this, and our recommendations are that if the equipment is to be used for a safety critical application or as part of a high priority security system, the use of public, licence exempt should be avoided. It should not even be considered. Such systems have to use licenced bands.

Similarly when high quality video and interference free operation is essential a licence band should be used. In these applications the licence exempt bands should only be used if it is impossible to obtain a licence.

Licence exempt frequencies could also be considered in CCTV systems for commercial areas or in small housing complexes. However if this is done, the customer has to be advised of the interference risk. They should not however be used in a large or significant citywide systems because interference is almost inevitable. Indeed many systems that use public bands have been switched off simply because the interference problems are now becoming intractable.

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